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(21) International Application Number: PCT/GB00/03504

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(71) Applicant (*for all designated States except US*): **A-Z FORMEN-UND MASCHINENBAU GMBH** [DE/DE];
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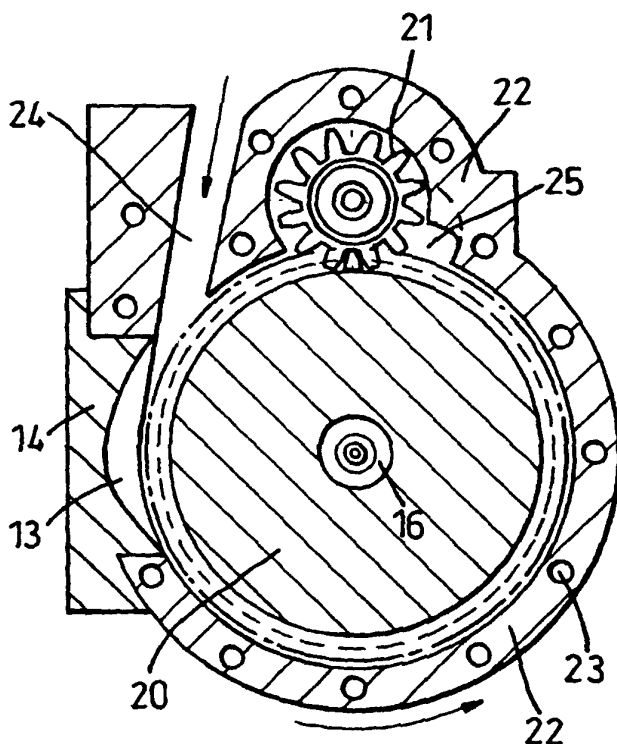
Published:
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(72) Inventor; and

(75) Inventor/Applicant (*for US only*): **MEYER, Paul** [GB/CH]; Via Locarno, 27 B, CH-6612 Ascona (CH).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GEAR PUMP EXTRUDERS



(57) Abstract: An extruder for polymeric or elastomeric material includes a gear pump having a casing (1) in which a pair of toothed gearwheels (20, 21) rotate, a feed inlet (24) for feeding material into an intake nip between a gearwheel (20) and the casing (1), and an outlet (25) for the material. In order to provide a substantially continuous feed of material, and for degaging of the material, at least one recess (13) is provided in the casing for the intake nip, to prevent feed strip or sheet being cut off at the nip. Air or gas will tend to be expelled backwards through the inlet (24), or may be expelled by a non-fed gearwheel (21). An escape passage may be provided for such air or gas.

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INTERNATIONAL SEARCH REPORT

Intel Internal Application No
PCT/GB 00/03504

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29C47/76 F04C2/18 B29C47/50 B01F5/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29C F04C B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 855 927 A (UTH PETER JOACHIM ET AL) 5 January 1999 (1999-01-05)	1-4, 6-8, 10, 13-15
Y	column 1, line 1 - column 2, line 50; figures 1, 3, 6	11, 18, 19
X	WO 00 20759 A (DOW CHEMICAL CO) 13 April 2000 (2000-04-13) page 1, line 31 - page 2, line 2 page 5, line 10 - line 15; figures 4, 7	1, 7
Y	DE 197 17 295 A (DANFOSS AS) 29 October 1998 (1998-10-29) column 1, line 1 - line 20 column 9, line 55 - line 68	11
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

22 March 2001

Date of mailing of the international search report

30. 03. 01

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03504

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 98 09792 A (LIMPER ANDREAS) 12 March 1998 (1998-03-12) cited in the application page 1, paragraph 1 -page 3, paragraph 1; figure 1 ---	18,19
A	EP 0 816 049 A (TROESTER MASCHF PAUL) 7 January 1998 (1998-01-07) abstract; figure 1 ---	2
A	GB 1 574 357 A (UNION CARBIDE CORP) 3 September 1980 (1980-09-03) page 10, line 17 - line 20; figure 10 ---	6
A	FR 720 949 A (FORGES ET ATELIERS DE MEUDON) 1 March 1932 (1932-03-01) page 1, line 1 - line 10 page 2, line 30 - line 61; figure 5 ---	12
A	DE 196 14 894 A (HASSE HARTMUT) 17 April 1997 (1997-04-17) figure 2 -----	13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 00/03504

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

9, 11, 12, 16, 17, 18-22
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8, 10, 13-15

Details of the intake region

2. Claims: 9, 11, 12, 16, 17

Adaptations of the outlet region for use with one non-fed gearwheel.

3. Claims: 18-22

Gear pump extruder co-operating with second extruder.

4. Claim : 23

Driving of gearwheel.

5. Claims: 24, 25

Degassing through the end plates

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/03504

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5855927 A	05-01-1999	DE 19639735 A EP 0839630 A	02-04-1998 06-05-1998
WO 0020759 A	13-04-2000	AU 6049799 A	26-04-2000
DE 19717295 A	29-10-1998	AU 7030598 A CN 1252852 T WO 9848148 A EP 0977933 A	13-11-1998 10-05-2000 29-10-1998 09-02-2000
WO 9809792 A	12-03-1998	DE 19635706 A EP 0925167 A	05-03-1998 30-06-1999
EP 0816049 A	07-01-1998	DE 19647904 A CZ 9701880 A JP 10058522 A US 6106266 A	08-01-1998 18-02-1998 03-03-1998 22-08-2000
GB 1574357 A	03-09-1980	NONE	
FR 720949 A	01-03-1932	NONE	
DE 19614894 A	17-04-1997	BR 9708697 A WO 9738837 A EP 0904183 A JP 2000507520 T PL 329529 A	04-01-2000 23-10-1997 31-03-1999 20-06-2000 29-03-1999

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PMM1950	FOR FURTHER ACTION <small>see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</small>	
International application No. PCT/GB 00/ 03504	International filing date (day/month/year) 13/09/2000	(Earliest) Priority Date (day/month/year) 15/04/2000
Applicant A-Z FORMEN-UND MASCHINENBAU GMBH et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☒ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

5

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 00/03504

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see additional sheet

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

22 March 2001

Date of mailing of the international search report

30. 03. 01

Name and mailing address of the ISA

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Fax: (+31-70) 340-3016

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03504

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GB 1574357	A	03-09-1980	NONE	
FR 720949	A	01-03-1932	NONE	
DE 19614894	A	17-04-1997	BR 9708697 A WO 9738837 A EP 0904183 A JP 2000507520 T PL 329529 A	04-01-2000 23-10-1997 31-03-1999 20-06-2000 29-03-1999